A UNIQUE POPULATION OF WATER BIRDS IN NORTHERN OHIO—1937

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Southwest of Sandusky, Ohio, and a dozen miles due south from Sandusky Bay, Lake Erie, is loeated the little eity of Bellevue. The inhabitants boast of Bellevue as "the eity without any sewers". The explanation of this anomaly is coneerned with the development of a most remarkable population of water birds in the Bellevue area during the summer of 1937.

The baekground is one of geology. Bellevue rests on a formation of Devonian limestone. A belt averaging twelve miles in width outerops from the Lake Erie shore southwards for nearly fifty miles. This eorniferous limestone is extremely soluble, so that surfaee waters enlarge every eraek they penetrate and sink in, forming elaborate eonnected systems of underground ehannels. Sinkhole topography is general, with little or no development of surface drainage systems.

Surface waters from as far south as the divide between the Ohio-Lake Erie drainage systems pass northward through these underground ehannels past Bellevue to Sandusky Bay, emerging as mammoth artesian springs at Miller's Pond, Green Spring, and Castalia. The largest of the several Blue Holes at Castalia delivers 5,000 gallons of water a minute. Holes punehed in this rock formation enable rural landowners to solve all farm drainage problems and eity dwellers to dispose of sewage wastes.

On about six oeeasions sinee 1800 this eonvenient arrangement has "baekfired". The last eruption, late in June, 1937, was by far the most serious and extensive. Cloudbursts on June 21 were followed by heavy rain which began on June 24 and resulted in 7.84 inehes of preeipitation in the Bellevue area and nearly as mueh in most of north eentral and northwestern Ohio. At Bueyrus the total preeipitation for June (mostly in the last week) was 14.81 inehes. Soon a waterhead of more than eighteen feet developed. Loeal flood waters were augmented by the thousands of aetive artesian springs that developed over night. In single fields were several hundred little fountains from as many springs. In one area of less than an aere the writer eounted 134 springs, including a number of large size. With no surfaee drainage, every sinkhole basin became a large lake. This grew until it spilled over the divide and created a dashing torrent whieh spiraled around the countryside spreading destruction on every hand. The law of gravity seemed to have been "repealed", with flood waters

bursting from hill tops and crossing ridges that would be immune except in a topsy-turvy flood.

In Bellevue geysers spouted from dooryards or lifted masses of pavement from the streets. Some 160 houses were inundated. All highways in the region were impassable for many days. Several that crossed sinkhole basins were blocked by water for more than two months. Some farmers were forced to use boats for weeks to reach their homes. Many trees died because the water suffocated the roots. Basements refilled with subterranean water as rapidly as it was pumped out. The original flood conditions redeveloped twice during the first two weeks because of subsequent cloudbursts.

For three weeks after the floods began, transportation difficulties made it nearly impossible to check on most of the water areas to determine the number of water birds attracted. By July 15, the twenty-five square miles estimated to have been covered by flood waters in the Bellevue area at one time had dwindled to about 1,500 acres of land-locked ponds which slowly decreased in size.

My record of the rise and fall of the water bird population of this area is supplemented by the observations of Louis W. Campbell, of Toledo; Dr. John W. Aldrich and F. W. Braund, of the Cleveland Museum of Natural History; Gene Rea, of Columbus; and Edward S. Thomas, of the Ohio State Museum.

These thirty-five ponds were located as follows: Twenty-one were north of Bellevue (see Bellevue Quadrangle of the U. S. Geological Survey), ten being in Sandusky County (all in York Township), and eleven in Erie County (all in Groton Township). Fourteen were southwest of Bellevue (see Siam Quadrangle), in Seneca County (Thompson Township, 12; Adams Township, 1; and Scipio Township, 1).

These ponds were not large in total acreage, but were ideal in distribution and nature to support large summer populations of water birds. Their shore line length was great. Many low islands were included. The waters were shallow and teeming with stranded fish. Conditions were such that immense numbers of aquatic insects and other small water animals developed. Flooded wheat fields were most attractive to ducks and grebes. The grain was ripe but uncut, remaining erect throughout the summer, providing ideal food and cover. Fields originally in corn and potatoes became ideal mud flats as the waters slowly retreated, exposing new areas for shore birds each week. Some species of shore birds were most attracted to the hillsides high above the ponds where the spring waters spread out in broad, alluvial fans.

The thirty-five ponds totaled 1,210 acres on July 15, 693 acres on August 1, 432 acres on August 15, 208 acres on September 1, and 128 acres on September 23. Fall rains stopped the shrinkage of many ponds so that a number of small pools totaling 100 acres remained as late as November 1.

The drop in water level was nearly synchronized in the different ponds, but the larger, deeper ones lasted longer. As the harvest of fish and other water animals at one pond was completed with its disappearance, the water birds present moved on to adjacent ponds. It is thought, however, that the maximum populations recorded for each pond, when totaled, will about equal but not much exceed the total population present. The largest count for each of the thirty-five ponds, when totaled, gives the maximum summer population for the area as 5,170 ducks, 4,900 shore birds, and 1,134 herons. The height in numbers varied for each species but came earliest for shore birds (August 5 to 20), next for herons (August 25 to September 10), and latest for ducks (September 5 to September 25).

Reasonably accurate counts were made at the majority of the important ponds on each of fifteen dates: two counts in July, five in August, five in September, and three in October. Permanent records of several of the rarer species were made by collection. In all, eight species of herons and bitterns, thirteen species of ducks, twenty-seven species of shore birds, and eighteen species of other water birds, or a total of sixty-six aquatic species, were recorded.

The heron population was augmented from large colonies of the Great Blue Herons and Black-crowned Night Herons in the general region, and a heavy influx of "white herons" from the south. The duck population, before early September, probably was drawn from Ohio breeding ducks of the nearby Lake Erie marshes of Lucas, Ottawa, Sandusky, and Erie Counties. Elsewhere in Ohio in 1937, the unusually high level of Lake Erie, reservoirs, and streams made few sites attractive to shore birds. My own observations, supplemented by those of various ornithologists of the State, make it possible to list for comparison the approximate 1937 maximum shore bird populations (July to September) at each of the principal shore bird areas of the State:

Sandusky area	800	Youngstown region	800
Lower Maumee River	700	Buckeye Lake	75
Lucas—Ottawa marshes	500	Indian Lake	50
Painesville—Ashtabula area	300	Grand Reservoir	125
Pymatuning Lake	250	Portsmouth area	120

Thus it seems highly probable that the unusual events in the Bellevue area in the summer of 1937 attracted a shore bird population

approximately equal to that of the remainder of Ohio. In the following lists the name of each species is preceded by two numbers; the first represents the number of trips (out of the fifteen recorded) on which that species was noted, and the second represents the total number of individuals counted (or in some cases estimated) on all trips combined. Many individuals, of course, were recounted on several of the weekly counts, but the total number enumerated, together with the number of trips on which recorded, gives a good index to the relative numbers present. The species in each group are listed in the order of abundance. Those of rare occurrence in northern Ohio are starred. The vernacular names used follow the 1931 A. O. U. Check-List.

A. Shore Birds—Twenty-seven species.

14—1,398	Pectoral Sandpiper	6—23	Black-bellied Plover
13—1,238	Semi-palmated Sandpiper	5—20	Western Sandpiper
12—1,177	Least Sandpiper	3—20	Sanderling
14—1,100	Lesser Yellow-legs	1— 6	*Long-billed Dowitcher
13— 922	Killdeer	2— 4	White-rumped Sandpiper
13— 530	Semi-palmated Plover	2— 2	Ruddy Turnstone
15— 248	Wilson Snipe	2— 3	American Woodcock
11— 222	Greater Yellow-legs	2— 3	*American Knot
13— 125	Spotted Sandpiper	1— 2	*Buff-breasted Sandpiper
7— 103	Eastern Dowitcher	1— 1	Piping Plover
8— 98	Stilt Sandpiper	1— 1	Golden Plover
11— 82	Solitary Sandpiper	1— 1	*Hudsonian Godwit
3— 54	Red-backed Sandpiper	1— 1	*Northern Phalarope
6— 32	Baird's Sandpiper		

B. Ducks—Thirteen species.

15—5,846	Common Black Duck	2—26	Redhead
15—3,844	Common Mallard	2—18	Lesser Scaup Duck
7— 872	Blue-winged Teal	6—16	Shoveller
4— 137	Baldpate	3—16	Gadwall
5— 78	American Pintail	1— 6	Ruddy Duck
5— 36	Green-winged Teal	3— 3	Canvas-back
7— 27	Wood Duck		

C. Herons and Bitterns—Eight species.

11—549	Black-crowned Night Heron	9—61	Little Blue Heron
15—446	Great Blue Heron	10—29	American Bittern
13—308	American Egret	2— 3	Eastern Least Bittern
12—286	Eastern Green Heron	1— 1	*Snowy Egret

D. Other Aquatic Birds—Eighteen species.

6—26,700	Bank Swallow	3—3	Herring Gull
14— 148	Pied-billed Grebe	3—3	Duck Hawk
9— 92	American Coot	2—3	King Rail
13— 61	Eastern Belted Kingfisher	2—3	Sora
15— 46	Marsh Hawk	2—2	Osprey
6— 13	Florida Gallinule	2—2	Caspian Tern
5— 21	Ring-billed Gull	1—2	Common Tern
4— 6	Virginia Rail	1—2	Bonaparte's Gull
3— 5	Black Tern	1—1	*Forster's Tern

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